

# Ecological Sciences

## Agrostology: Biology of Cool-Season Grasses Important for Soil and Water Conservation in the United States (ECS 313)

### Overview

This course is a follow-up of ECS-Biosystematics, Genetics and Plant Breeding Concepts. It explores in more detail the plant genetics and breeding concepts of cool-season grasses as they apply to plant materials work. It is an overview of grass tribes and covers grass morphology, terminology, basic genetics, and breeding systems, genetic relationships, and detailed descriptions of individual tribes such as triticeae, stipeae, avenae, and poeae.

### Objectives

1. provide intensive training for plant materials specialists, PMC managers, and PMC soil conservationists in grass systematics to enable the preparation of technically proficient project plans focused on the improvement of grass germ plasm for conservation use.
2. develop an awareness of practical tools used to collect basic information on cool-season grasses.
3. develop a working knowledge of the ecological characteristics of major cool-season grass genera.
4. provide model for cooperative interagency coordination of grass germ plasm improvement.

### Prerequisites

ECS-Biosystematics, Genetics and Plant Breeding Concepts or equivalent college courses

### Duration

1 week

### Eligibility

This course is primarily for PMC managers and staff. Plant materials specialists who have a need for the training and those who have responsibility for pasture and hayland, and range and woodland grazing programs may attend.

# Ecological Sciences

## Agrostology: Biology of Warm-Season Grasses Important for Soil and Water Conservation in the United States (ECS 323)

### Overview

This course is a follow-up of ECS-Biosystematics, Genetics and Plant Breeding Concepts. It explores in more detail the plant genetics and breeding concepts of warm-season grasses as they apply to plant materials work. It is an overview of grass tribes and covers grass morphology, terminology, basic genetics, and breeding systems, genetic relationships, and detailed descriptions of individual tribes such as paniceae, andropogoneae, chlorideae, and zizanieae.

### Objectives

1. provide intensive training for plant materials specialists, PMC managers, and PMC soil conservationists in grass systematics to enable the preparation of technically proficient project plans and studies focused on the improvement of grass germ plasm for many conservation uses.
2. develop an awareness of practical tools used to collect basic information on warm-season grasses.
3. develop a working knowledge of the ecological characteristics of major warm-season grass genera.
4. provide a model for cooperative interagency coordination of grass germ plasm improvement.

### Prerequisites

ECS-Biosystematics, Genetics and Plant Breeding Concepts or equivalent college courses

### Duration

1 week

### Eligibility

This course is primarily for PMC managers and staff. Plant materials specialists who have a need for the training and those who have responsibility for pastureland and hayland, and range and woodland grazing programs may attend.

# Ecological Sciences

## Biology of Legumes Used for Soil and Water Conservation (ECS 414)

### Overview

Participants will learn the biosystematics and genetics of legume species used in soil and water conservation programs. Emphasis is placed on species used for cover and green manure (natural forms of nitrogen), living mulches, and erosion control cover. The biochemistry and microbiology of nitrogen fixation also will be reviewed. Information will enable plant materials scientists to develop improved conservation cultivars using state-of-the-art methodology.

### Objectives

Upon completion of this training, participants will be able to:

1. develop plant materials study plans to develop legume cultivars using state-of-the-art techniques.
2. describe nitrogen-fixation and differences among legume species under varying environmental conditions.
3. apply accepted selection and breeding methods to legumes.
4. develop technology transfer materials enabling more efficient use of legumes in conservation management systems.

### Prerequisites

Basic Plant Genetics and Biosystematics or equivalent college courses

### Duration

1 week, including field exercise

### Eligibility

Primarily plant materials scientists will benefit from this training, but agronomists and range conservationists may also attend.

### Other Information

This course includes preparation of review article on a major legume species or species complex. Instructors are leading scientists in the field.

# Ecological Sciences

## Biology of Tree and Shrub Species Useful for Soil and Water Conservation (ECS 424)

### Overview

Participants will learn the biosystematics and genetics of major tree and shrub species useful for vegetative practices in conservation management systems. Emphasis is placed on species used for windbreaks, but also includes woody plants used for bioengineering and gully erosion control. Information will enable plant materials scientists to develop the most efficient selection procedures in cultivar development. Application of hybridization and tissue culture will be discussed.

### Objectives

Upon completion of this training, participants will be able to:

1. develop PMC study plans to develop woody plant cultivars using state-of-the-art techniques.
2. describe how woody plants impart conservation effects on resources.
3. apply accepted selection and breeding methods to woody plants.
4. produce hybrid progeny of important woody plant species.

### Prerequisites

Basic Plant Genetics and Biosystematics or applicable college courses dealing with similar subjects

### Duration

1 week including field exercise

### Eligibility

Primarily intended for plant materials scientists on an as-needed basis; also open to foresters, biologists, and range conservationists

### Other Information

Training includes preparation of a review article on a major woody plant species. Instructors include leading scientists in the subject areas.

# Ecological Sciences

## Biosystematics, Genetics, and Plant Breeding Concepts (ECS 434)

### Overview

This course introduces plant materials personnel to state-of-the-art concepts and methods used by research geneticists and plant breeders:

Basic Plant Genetics - DNA, chromosomes, genes, meiosis, chromosome crossing over, modes of reproduction, inheritance, and gene manipulation techniques.

Introduction to Biosystematics - Modes of speciation, natural hybridization, and taxonomic considerations.

Plant Breeding Concepts and Methods - Heritability, mass selection, recurrent selection, heterosis, synthetics, and interspecific hybrids.

A part of this course will be devoted to incorporating genetic principles and plant breeding techniques into plant materials center project plans.

### Objectives

Upon completion of this training, participants will be able to:

1. apply basic plant genetics and biosystematic principles to the plant materials program.
2. apply plant breeding concepts and methods to the selection and development of improved conservation cultivars.
3. communicate more effectively with research geneticists.

### Prerequisites

None

### Duration

1 week

### Eligibility

All professional plant materials employees with priority given to plant material specialists and plant material center managers with one year experience may attend.

# Ecological Sciences

## Experimental Design and Statistical Analysis (ECS 556)

### Overview

This course introduces plant materials personnel to concepts and methods used by natural resource scientists who conduct research. Course content includes:

1. basic principles of experimental design and statistical analysis with application to plant materials work, rationale for using, descriptive statistical terms, etc.
2. types of experimental designs, including student exercises, setting up experiment and analyzing dummy data:
  - a. completely randomized
  - b. randomized complete block
  - c. latin square
  - d. split plot variations
3. methods of sampling to assure valid results.
4. overview to some advanced experimental designs:
  - a. factorial experiments
  - b. linear regression and correlation
  - c. multi-variate techniques.

### Objectives

Upon completion of this training, participants will be able to:

1. understand the need and application of proper experimental design for plant materials center work.
2. develop round experimental designs to be used for all initial and advance evaluation at plant materials centers.
3. carry out sound sampling techniques to permit accurate analysis of data.
4. analyze collected data from three to five different experimental designs.
5. communicate more effectively with statisticians.

### Prerequisites

None

### Duration

1 week

### Eligibility

GS-5 through GS-11 positions at Plant Materials Centers and personnel who will be involved with the design and data analysis from PMC studies may attend.

# Ecological Sciences

## Farm Management and Agronomy Principles for PMC Biological Technicians (ECS 575)

### Overview

This course provides training in operational procedures and agronomic principles that relate to Plant Materials Center operations.

### Content

Subject matter includes:

- you, your job, and training.
- pesticide use, safety, record keeping, new equipment.
- irrigation techniques and management (field exercise).
- advances in weed control.
- seed handling: harvest, cleaning, storage.
- nursery stock: digging, storage, shipping.
- greenhouse management.
- working with people: managers, WAEs, public.
- Konza Prairie tour - Kansas State University.
- woody plant propagation.
- insect problems and control.

### Prerequisites

None

### Duration

1 week

### Eligibility

Biological technicians and farm managers located at Plant Materials Centers may attend this course.

# Ecological Sciences

## Forest - Windbreak - Soil Correlation (ECS 610)

### Overview

This course trains soil survey project staff, and state and area specialists to effectively correlate forest and windbreak information and interpretations with soil types.

### Objectives

Upon completion of this training, participants will be able to:

1. identify necessary publications and reference materials to conduct forest-windbreak-soil correlation.
2. assist in preliminary organization of a soil survey team and determine survey procedures and products to meet user needs.
3. collect field data using the Soil-Woodland Correlation Field Data Sheet (NRCS-ECS-005), the Windbreak-Soil-Species Evaluation form (NRCS-ECS-004), and other documentation methods.
4. enter, edit, and analyze collected data using the National Forest Soil Database (NFSDB) computer system.
5. apply data analyses to assist in soil classification and correlation including development of class-determining phases.
6. make and correlate forest and windbreak interpretations and attributes with soil types.
7. recognize the variety of methods and formats for displaying interpretations to soil survey user groups.

### Prerequisites

Background knowledge of soil survey procedures; job responsibilities in forest-soil or windbreak-soil correlation; basic skills in using UNIX commands and vi editor

### Duration

1 week

### Eligibility

Soil survey project leaders, soil scientists, foresters, range conservationists, biologists, and soil conservationists from public agencies or in the private sector involved with forest-soil or windbreak-soil correlation may attend.



# Ecological Sciences

## Forest Water Quality (ECS 620)

### Overview

This course trains state and area specialists to effectively carry out a conservation program that uses trees and forest practices to protect water quality and quantity.

### Objectives

Upon completion of this training, participants will be able to:

1. identify sensitive watershed conditions and recognize aquatic resources.
2. describe nutrient cycling in the tree/forest systems.
3. identify and compare harvesting systems and site preparation methods.
4. recognize design and control features for low volume forest access roads.
5. layout preliminary locations of roads, skid trails and landings.
6. inventory and evaluate riparian areas and design buffer zones.
7. assemble and present a site-specific forest water quality plan.
8. list and compare forest and water quality back-home strategies.

### Prerequisites

None

### Duration

1 week

### Eligibility

Suggested participants include: foresters, soil conservationists, WQ specialists, watershed planners, engineers, biologists, agronomists, and RC&D specialists. Several slots will be reserved for specialists from the Extension Service, U.S. Forest Service, state forestry agencies, state water quality agencies, SWCD foresters, industrial foresters, and consulting foresters.

# Ecological Sciences

## Forestry - Windbreak Technology (ECS 630)

### Overview

This course provides 30 hours of comprehensive windbreak training in the classroom and field. State-of-the-art aspects of determining windbreak feasibility, planning, installation, and maintenance will be covered.

### Objectives

Upon completion of this training, participants will be able to:

1. identify and detect wind-related problems at farmstead and field sites to determine the need for windbreaks.
2. describe windbreak functions, benefits, and design.
3. determine area to be protected and inventory its present condition.
4. recognize acceptable planting stock and handling and storage procedures; describe site preparation alternatives; and perform alternative planting techniques.
5. prepare windbreak alternatives that meet cooperator objectives, solve wind related resource problems, and are cost effective.
6. assemble and present a site-specific windbreak planting plan including design, site preparation, planting, and maintenance.
7. recognize the need for windbreak renovation.
8. design a windbreak marketing plan for back home.

### Prerequisites

None

### Duration

1 week

### Eligibility

Field office staff members who are primarily in resource and agricultural specialties that need to increase their expertise in windbreak technology. Course is open to district and state employees.

# Ecological Sciences

## Introduction To Ecological Principles: A Basic Biology Course (ECS 650)

### Overview

This is an introduction course for employees who have not had a basic ecology course. It will give students an understanding of ecological principles. The course consists of a self-paced workbook with exercises followed by a video presentation.

### Objectives

1. provides a basic understanding of ecological principles
2. describes and defines the term "ecosystem"
3. provides a basic knowledge of the following ecological principles and concepts and their interactions: energy flow, hydrologic cycle, mineral cycles, factors limiting species distribution and population size, and characteristics of species, populations, and communities.

### Prerequisites

None

### Duration

Approximately 8 hours. The self-paced workbook with exercises should be completed in approximately 6 hours. The workbook is followed by a two - hour video.

### Eligibility

This course is primarily for NRCS employees who have not had a basic ecology course.

# Ecological Sciences

## Natural Resources Conservation Course (ECS 660)

### Overview

This course provides employees with an awareness of the direction our agency is going in natural resources conservation. It emphasizes the importance of integrating the social, economic, and ecological considerations into the planning process. It builds on knowledge and experience developed over the last 60 years to expand our planning focus. Basic skills in consensus building and conflict resolution are also provided. The course consists of 15 video tapes and a student notebook with exercises. The course can be self-paced or given in a group setting.

### Objectives

Upon completion of this training, participants will have an awareness:

1. for integrating the social, economic, and ecological considerations into the planning process.
2. for using the NRCS planning process to develop, implement, and evaluate conservation plans.
3. of areawide conservation planning, conservation planning, and their relationship.

### Prerequisites

Introduction to Ecological Principles (or equivalent) and the Ecological Principles video tape

### Duration

Approximately 25-30 hours.

### Eligibility

All NRCS employees.

# Ecological Sciences

## Plant-Herbivore Interactions (ECS 705)

### Overview

This course provides an in-depth understanding of the interrelationship between plants and the grazing and/or browsing animal. Major emphasis is placed on evolved structural and chemical plant protections to grazing, and animal behavior in relation to their selection of food and habitat. A knowledge of plant-herbivore interactions is essential for NRCS personnel in assisting clients in designing grazing management plans to solve the critical issues of soil, water, air, plant, and animal resource problems on grazing and wildlife lands. This training will cover the state-of-the-science concepts, and the application of those concepts, as well as the research on which the concepts are founded.

### Objectives

Upon completion of this training, participants will be able to better assist land managers to design and apply grazing management plans by explaining:

1. plant responses to disturbances with emphasis on how plants (a) tolerate and (b) avoid disturbance through chemical and morphological mechanisms.
2. (a) different conceptual models of diet selection and (b) specific mechanisms used to select nutritious and avoid toxic plants.
3. how the intake of forage by herbivores is (a) controlled by their anatomy and physiology and (b) influenced by the morphological and chemical characteristics of the forage.
4. current concepts of habitat selection and their implications for researchers and managers relative to changing habitat selection patterns and enhancing carrying capacity.
5. how the above relates to grazing management and future research.

### Prerequisites

None

### Duration

10 days

### Eligibility

All who need to understand the details of plant-herbivore ecosystems that occur on rangeland, forest land, native pasture, pastureland, and grazed cropland.

# Ecological Sciences

## Plant Materials - Field and Laboratory Techniques (ECS 715)

### Overview

Participants will learn common state-of-the-art techniques in micropropagation, cytology, hybridization, tissue analysis, and other bioassays required in the development of improved conservation plants and technology. The course will be tailored to the needs of the participants as required.

### Objectives

Upon completion of this training, participants will be able to use the knowledge gained to complete technical projects for which they are responsible. Examples include chromosome counts and karyotypes, tissue culture of difficult to propagate plants, nutrient uptake by plants, etc.

### Prerequisites

None

### Duration

24-32 hours, with emphasis on lab work

### Eligibility

Plant materials scientists may attend, but also can be structured for biologists, agronomists, foresters, and water quality specialists involved in special projects.

### Other Information

Course limited to 8 participants; length, subject area, type of instruction flexible to meet particular need.

# Ecological Sciences

## Plant Physiology Seminar (ECS 725)

### Overview

Participants will acquire information in various topic areas depending on need. Subjects may include photosynthesis, carbohydrate partitioning, regulation of plant growth/development, plant/water relationships, nutrient/chemical metabolism, etc.

### Objectives

Upon completion of this seminar, participants will be able to understand the mechanisms of how plant physiological processes underlie the conservation effects of a vegetative conservation practice. For example, a deep rooted range shrub continues to pump deep moisture at night, releasing it through feeder roots in the topsoil, making it available to understory grasses to use the following day.

### Prerequisites

College level plant physiology

### Duration

16-32 hours depending on need, may include field exercise

### Eligibility

All employees with ecological sciences background, and others as needed

### Other Information

Seminar structured to meet specific need to enhance technical proficiency in agency, relating to the application of conservation management systems in high priority program areas.

# Ecological Sciences

## Prescribed Burning (ECS 806)

### Overview

This course establishes an understanding of Natural Resources Conservation Service policy on prescribed burning and teaches employees the basics, considerations and methods needed to plan and design prescribed burns with cooperators. The course will include classroom study, experience in design of prescribed burns and actual application of prescribed burning. Ten people will be the maximum to attend each one week course to allow all participants full opportunity for participation.

### Objectives

Upon completion of this training, participants will be able to:

1. explain and apply Natural Resources Conservation Service policy on prescribed burning.
2. explain the effects of fire on soil, water, air, plants, and animals.
3. prescribe the weather conditions necessary to accomplish a safe and successful burn.
4. describe wildlife considerations.
5. describe animal use considerations.
6. calculate fire behavior.
7. explain and use firing methods.
8. use prescribed burning equipment.
9. determine fuel moisture.
10. plan and apply fire suppression.
11. design a prescribed burn plan.
12. use a prescribed burning expert system.

### Prerequisites

None

### Duration

1 week

### Eligibility

Natural Resources Conservation Service personnel responsible for technical leadership in prescribed burning at the national, regional, and state levels will be given top priority. Field office personnel needing training in prescribed burning may attend when space is available.



# Ecological Sciences

## Rangeland Ecology (ECS 816)

### Overview

This course covers a broad section of plant ecology addressing the plant, population, and community levels of vegetation organization for both the grass and shrub life forms. The subdisciplines of physiological ecology, developmental morphology, population ecology, landscape ecology, hydrology, and global change will all be addressed in an integrated manner to provide a current overview of each of the topics listed. Course materials will be presented in a combination of lecture, discussion, and demonstration.

### Objectives

Upon completion of this training, participants will be able to:

1. define developmental morphology of grasses.
2. explain physiological ecology of grasses.
3. explain the potential detrimental and beneficial plant responses to herbivory.
4. define the state of the science of succession and rangeland evaluation.
5. explain the role of shrubs in ecosystems.
6. describe grass/shrub interactions.
7. define the mechanisms of shrubland invasion.
8. explain the hydrologic cycle and the effects of land use practices on hydrology.
9. explain global change.

### Duration

7 days of study

### Eligibility

Natural Resources Conservation Service employees who need to understand the state of the science details of range ecology may attend this course. Personnel working with rangeland, pastureland, grazeable woodland and native pasture should attend this course since the basic principles of plant growth and interactions are very applicable to all grazing lands.

# Ecological Sciences

## Water Quality - Resource Assessment (ECS 850)

### Overview

This course provides training in the following subject areas:

- basic water quality principles.
- interdisciplinary use of the “Water Quality Indicators Guide” in NRCS.
- aspects of nonpoint source water quality problems.
- ecology of freshwater systems.
- using the “Water Quality Indicators Guide” field sheets in addressing total resource planning.
- development of water quality resource management plans.

### Objectives

Upon completion of this training, participants will be able to:

1. identify water quality problems.
2. assess water quality activities.
3. address water quality concerns in total resource planning.
4. develop a water quality resource management plan.

### Prerequisites

None

### Duration

3 days

### Eligibility

Participants should have a basic knowledge of resource planning.

# Ecological Sciences

## Wetland Restoration and Enhancement (ECS 885)

### Overview

Participants will learn to assess, plan, and implement the restoration or enhancement of wetlands. The course will emphasize wetland ecology, planning for wetland functions, design and implementation, and legal considerations. There are specific courses for several types of wetlands: prairie potholes, bottomland hardwood, riparian, forested wetlands, and others.

Each course is presented in two phases. Phase I pertains to generic principles applicable to all wetlands. The precourse assignment consists of workbooks, exercises, and tests completed at participants' work place. Upon successful completion of phase I, participants will attend phase II. Phase II is on-site training at field sites within the geographic area specified.

### Objectives

Upon completion of phase I and II, participants will be able to:

1. describe ecological processes necessary for wetland restoration and enhancement.
2. describe the physical, chemical, and biological processes of a wetland.
3. determine the existing and potential functions of a potential restoration or enhancement site.
4. complete a wetland site evaluation and determine associated opportunities and constraints.
5. describe the methods used to restore, manage, maintain, and monitor the wetland system.
6. with supervision, restore/enhance wetlands in the geographic area of participants' duty stations.

### Prerequisites

Two years experience

### Duration

Phase I - approximately 20 hours. Phase II - 32 hours

### Eligibility

NRCS and other agency employees who develop restoration/enhancement plans or who review them.

# Ecological Sciences

## ECS - Hydric Soils For Wetland Delineation (ECS 890)

### Overview

This course enables non soil scientists to perform hydric soils determinations and field delineations, using standard techniques of soil science. It also enables participants to complete technically accurate documentation. Soil scientists with **less than two years** experience may also attend.

Covered in the training are:

1. use of hydric soils definition and criteria.
2. use and identification of hydric soil field indicators.
3. landscape, vegetation, and soil relationships.
4. use of soil classification for hydric soil identification.
5. use of soil surveys for hydric soil identification.

### Objectives

Upon completion of the training, participants will be able to:

1. improve the quality of wetland delineations.
2. improve the efficiency and credibility of wetland delineations delivered to the public.
3. prepare thorough documentation to reduce the duplication of effort in the number of appeals, litigation, and elevated cases.
4. recognize and correctly apply hydric soil field indicators for normal, disturbed, and problem soils for the region in which they work.

### Prerequisites

Regulatory IV - Identification and Delineation of Wetlands - recommended, but not required.

### Duration

32 hours

### Eligibility

All employees who are responsible for hydric soil identification. **Soil Scientist with more than 2 years experience will not benefit from this course.**

# Ecological Sciences

## Hydrology Tools For Wetland Determination (ECS 895)

### Overview

This course provides multi-agency participants with training needed to correctly select, from seven available hydrology tools, the best tool to fit site conditions; to use the tools; and to review results of agency work and work by consultants. Tools covered include onsite field indicators, remote sensing, observation wells, streamflow and lake gage analysis, runoff volumes, scope and effect, and DRAINMOD.

### Objectives

Upon completion of this training, participants will be able to:

1. select and use the tool that best fits site conditions and available data to determine whether an area has wetland hydrology.
2. use provided methodology to make hydrologic analyses of wetlands.
3. improve significantly their wetland hydrology determination, delineation, and documentation skills.
4. describe tools used for hydrology in complex conditions where the hydrology, soils, or vegetation has been disturbed.

### Prerequisite

Have a basic knowledge of the following manuals:

1. 1987 Corps of Engineers Wetland Manual, 3rd Edition NFSAM.
2. Hydrology tools for Wetland Determination Manual (HTWDM).

### Duration

32 hours

### Eligibility

All employees who are responsible for hydric soil identification.

# Ecological Sciences

## Wind Erosion Process, Prediction, and Control (ECS 911)

### Overview

This rigorous training session spans 30 classroom and field hours. All state-of-the-art aspects of wind erosion prediction and control will be covered. Hands-on practice in the classroom and field will be emphasized. This course directly supports the implementation and maintenance of compliance plans for FSA (1995) and FACTA (1990).

### Objectives

Upon completion of this training, participants will be able to:

1. define the wind erosion process, identify field conditions conducive to wind erosion, and list the modes of soil transport by wind.
2. define the factors in the wind erosion equation and determine factor values for various field conditions.
3. estimate wind erosion using both the annual and management period methods of prediction.
4. identify and apply the basic principles of wind erosion control.
5. prepare wind erosion control alternatives using cooperator objectives, site features, and site limitations.
6. use the FOCS wind erosion equation software to estimate wind erosion.

### Prerequisites

None

### Duration

1 week

### Eligibility

Natural Resources Conservation Service employees who develop and apply wind erosion control systems to the land may attend.